

REMARKS

Informalities

Specification. The disclosure stands objected to because the serial number to the United States Provisional Application from which the present application claims priority was not included in the present application. Applicant appreciates the Examiner pointing out this deficiency. In response, the disclosure has been amended to include the parent United States Provisional Application Serial No. 60/210,270.

The specification has also been amended to reference specific features of the drawings. Applicant submits that no new matter is presented as such features find adequate support in the specification as filed.

Drawings. Enclosed herewith is another set of the informal drawings submitted with the original application as requested. Formal drawings are also enclosed. No new matter is presented as the application as filed provides sufficient support for the new drawings.

Statement of Substance of Interview. An interview with the Examiner was conducted on October 25, 2002 with regard to the above-referenced case. The amendments and remarks provided herein are reflective of the discussion the undersigned had with the Examiner in an effort to resolve the objections and rejections presently interfering with the allowance of the claims. In the interview, an agreement was reached that Applicant would amend the claims to include the limitation of "reading a first unique hemodynamic waveform [and] analyzing said waveform to identify unique traits." This limitation has been incorporated into each independent claim and thus distinguishes the present invention from the prior art.

Claim Rejections under 35 U.S.C. § 112 - First Paragraph

The first paragraph of 35 U.S.C. § 112 (“Section 112”) requires that the specification contain “a written description of the invention, and of the manner and process of making and using it . . . [so] as to enable any person skilled in the art . . . to make and use the same.”

JJ. Written Description

Claims 1-35 stand rejected under Section 112, first paragraph, as containing subject matter not described in the specification in such a way as to enable one skilled in the relevant art to make and/or use the invention.

Specifically, the Examiner first asserts that undue experimentation would be required for one of ordinary skill in the art to determine a criterion by which to differentiate between heartbeats. Applicant respectfully traverses this assertion; indeed, the present disclosure articulates a vast array of heartbeat characteristics that distinguish individuals, set out in detail on page 11 of the specification. For example, “the position on the upslope of the heartbeat waveform having the fastest rate of change slope can be recorded and various attributes of that position can be noted. The amplitude of that position, its position from the center of the pulse and amplitude of the actual beat relative to the position can all be measured and recorded.” See p. 11, ln. 2-6. In addition, various parameters associated with waveform peaks are identified which distinguish individuals. These include “the differences between the two peak amplitudes, the differences between the two peak rates of change, the relative position of the dicrotic notch, how deep the notch is, how far the dicrotic notch is from a zero point or from a reference point, and how far the dicrotic notch is from the center of one of the peaks, where the peak of the dicrotic notch is located along the horizontal, and the position of the various peaks from the center of the waveform and from the center of the other peak.” See p. 11, ln. 10-15. Such distinguishing features are also particularly referenced in Figure 1.

The Examiner next asserts that one skilled in the art would have to engage in undue experimentation to determine a criterion by which to differentiate individuals based on other live biological traits obtained according to the present invention. Applicant respectfully disagrees with Examiner as the specification discloses examples of substantially unique biological traits that may be analyzed to authenticate an individual in accordance with the invention. The scope of such disclosure is sufficient to enable one skilled in the art to practice the invention since such a person would appreciate the boundaries of permissible variation between biological measurements and would thus be able to implement the invention to authenticate an individual as set forth in the application.

Similarly, Applicant respectfully traverses Examiner's Section 112 rejection for failing to disclose how bone density is used for authentication. Rather, the specification discloses on page 12 that the "density of a particular kind of connective tissue, such as bone density, may be another substantially unique histological trait." Claim 28 discloses "reading a second internal physiological identifier" and claim 30 specifies that such identifier comprises bone density. Although the particular method by which bone density may be read is not specifically disclosed, one skilled in the art would appreciate and be able to implement such methods by virtue of the disclosure provided.

With respect to the Examiner's rejection of the claims on the basis that the method of authentication by comparison of heartbeat characteristics is not the best method for authentication of an individual, Applicant respectfully points out that 35 U.S.C. § 112 requires only that the specification set forth the "best mode contemplated by the inventor of carrying out his invention." Section 112 does not require that the inventor contemplate what the Examiner may view as the best invention.

Accordingly, Applicant respectfully requests withdrawal of rejections of claims 1-35 under Section 112, first paragraph.

Claim Rejections under 35 U.S.C. § 112 - Second Paragraph.

Claims 20, 33 and 34 stand rejected under Section 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant thanks the Examiner for noting the deficiency in claim 20 with regard to the phrase “such as.” This claim has been amended to cancel the phrase.

Claims 33 and 34 have been cancelled.

In light of the above, Applicant respectfully requests withdrawal of rejections of claims 20, 33 and 34 under Section 112, second paragraph.

Claim Rejections under 35 U.S.C. § 101.

Claims 20-27 stand rejected under 35 U.S.C. § 101 since data signals without more are non-statutory. Claim 20 has been amended to recite a “computer software program” rather than a “computer data signal.” This amendment adds no new matter as such finds sufficient support in the specification as filed. Claims 21-27 add further limitations to otherwise allowable subject matter. Applicant thus respectfully requests withdrawal of rejections of claims 20-27 under 35 U.S.C. § 101.

Claim Rejections under 35 U.S.C. § 102(b).

Claims 1, 2, 8, 16, 20-21, 26-28 and 30-31 stand rejected under 35 U.S.C. § 102(b) (“Section 102(b)”) as anticipated by U.S. Pat. No. 5, 719, 950 to Osten (“Osten”).

An invention is unpatentable under 35 U.S.C. § 102(b) (“Section 102(b)”) if “the invention was patented . . . more than one year prior to the date of the application for patent in the United States.” A Section 102(b) rejection is only appropriate, however, where the “reference fully discloses in every detail the subject matter of a claim.” *Application of Foster*, 383 U.S. 966 (1966). For the reasons set forth below, Applicant submits that the references cited by the Examiner do not teach each and every element of the claimed invention, as amended, and thus do not anticipate the claimed invention.

Osten teaches a personal biometric authentication system in which the combination of a unique, inherently specific biometric parameter recognized and compared with stored data and at least one non-specific biometric parameter of a physiological characteristic recognized and compared with physiological norms is used to control access to equipment or physical facilities. See Osten Abstract. Osten discloses examples of inherently specific biometric parameters, including fingerprints, palm prints, voice prints, handwriting and retinal configurations. Osten also provides examples of non-specific biometric parameters used for biometric validation to ensure that the subject is living. Osten teaches that physiological characteristics such as electrocardiograph signals, pulse, and spectral characteristics of human tissue exemplify such non-specific biometric parameters. See col. 3, ln. 4-8.

The present invention, on the other hand, claims a method for biometric authentication that includes “reading a first unique hemodynamic waveform of an individual [and] analyzing said waveform to identify unique traits.” See claim 1, as amended. This element is also recited in claims 16, 20 and 28, as amended. Examples of such unique traits are set out in detail on page 11 of the Specification and are represented diagrammatically in Figure 1. Applicant finds no mention of this element in the Osten reference, nor any equivalent thereof. Indeed, Osten specifically characterizes

an electrocardiogram signal as non-specific, and thus not inherently unique. Based on this characterization, Osten fails to disclose any unique traits that may be derived from an electrocardiogram signal and compared to previously recorded traits taken for an individual for authentication. The claimed steps of reading and analyzing a unique hemodynamic waveform to identify unique traits are thus not anticipated by the Osten reference under Section 102(b).

Claims 2, 8, 21, 26-27 and 30-31 place further limitations on otherwise allowable subject matter and should not therefore be considered anticipated.

Due to the Osten's ignorance of a significant claim element of the present invention, Osten fails to anticipate Applicant's invention. Applicant therefore respectfully requests withdrawal of the above-referenced rejections under Section 102(b).

Claim Rejections under 35 U.S.C. § 103.

An invention is unpatentable under 35 U.S.C. § 103(a) ("Section 103") "if the differences between the subject matter sought to be patented over the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains."

To establish a *prima facie* case of obviousness, three criteria must be met. "First, there must be some suggestion or motivation . . . to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP § 2142.

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *In re John R. Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992). Any such suggestion must be "found in the prior

art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 493 (Fed. Cir. 1991). Indeed, "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." MPEP § 2142.

A "clear and particular" showing of the suggestion to combine is required to support an obviousness rejection under Section 103. *Id.*

Applicant's claims 13, 15, 18, 19, 25, 32 and 34 stand rejected under Section 103 as unpatentable over Osten. Applicant's claims 3, 9, 11-12, 14, 22 and 33 stand rejected under Section 103 as unpatentable over Osten in view of U.S. Pat. No. 4,239,048 to Steuer ("Steuer"). In addition, Applicant's claims 4, 17 and 23 stand rejected under Section 103 as unpatentable over Osten in view of U.S. Pat. No. 4,544,267 to Schiller ("Schiller"). Finally, Applicant's claims 5-7 and 24 stand rejected under Section 103 in view of Osten, Steuer, Schiller, and further in view of Merriam-Webster's Collegiate Dictionary ("Merriam-Webster"). Claims 10 and 29 stand rejected as unpatentable over Osten in view of U.S. Pat. No. 4,699,149 to Rice ("Rice"). Applicant's claim 35 stands rejected as unpatentable over Osten in view of Steuer and further in view of U.S. Pat. No. 5,892,838 to Brady ("Brady"). Applicant respectfully submits that the above-referenced art, considered cumulatively, does not render the present invention obvious for the reasons set forth below.

A. Osten Reference

As discussed *supra* with respect to the Examiner's rejections under Section 102, Osten discloses a personal biometric authentication system in which the combination of a unique, inherently specific biometric parameter recognized and compared with stored data and at least one non-specific biometric parameter of a physiological characteristic recognized and compared with

physiological norms is used to control access to equipment or physical facilities. See Osten Abstract. Osten specifically teaches that electrocardiograph signals are non-specific biometric parameters. See col. 3, ln. 4-8.

Applicant has amended independent claims 1, 9, 16, 20, 28 and 35 to recite the steps of “reading a unique hemodynamic waveform of an individual [and] analyzing said waveform to identify unique traits.” No cited reference discloses nor suggests a method which recognizes a hemodynamic waveform, obtained by electrocardiograph signals, as an inherently unique biometric trait. In fact, Osten specifically references electrocardiograph signals as a non-specific biometric parameter. See col. 2, ln. 67 - col. 3, ln. 5. As a result, Osten also fails to disclose or suggest a method by which such waveform may be read and analyzed to identify certain unique traits.

By characterizing electrocardiograph signals as non-specific, Osten teaches away from any type of analysis in which a hemodynamic waveform is used to identify unique traits. One skilled in the art would not be inclined to modify or combine Osten with any other reference to substitute a hemodynamic waveform for one of the specific biometric parameters enumerated by Osten since Osten clearly labels electrocardiograph signals as non-specific, and emphasizes that their usefulness is limited to determining that a subject individual is alive by comparing the subject electrocardiograph signals with physiological norms for the species. See col. 3, ln. 47-49.

Since Osten fails to suggest, and in fact teaches away from, reading and analyzing a hemodynamic waveform to identify unique traits for authentication as claimed by the present application, the present invention is not rendered obvious in view of Osten under Section 103.

B. Steuer, Schiller, Merriam-Webster, Rice and Brady References

As discussed above, the Examiner has disregarded a significant claim element of the present invention. Indeed, each of the Steuer, Schiller, Merriam-Webster, Rice and Brady references also

fails to disclose or suggest reading and analyzing a hemodynamic waveform to identify unique traits for authentication as claimed by the present application. Thus, even if the cited references were combined as the Examiner suggests, the resulting method or apparatus would not produce Applicant's invention.

Applicant respectfully submits that the inability of the combined references to produce Applicant's invention and the lack of any suggestion or motivation to modify such art to produce Applicant's invention renders the present invention non-obvious in view of such references. Thus, Applicant respectfully requests withdrawal of the rejections of the above-referenced claims under Section 103 as unpatentable over Osten, Steuer, Schiller and Merriam-Webster, Rice and Brady.

Conclusion

Based on the foregoing, Applicant believes that the claims of the present invention are in condition for allowance and respectfully requests the same.

Should the Examiner have any questions, comments, or suggestions in furtherance of the prosecution of this application, the Examiner is invited to initiate a telephone interview with undersigned counsel.

DATED this 13 day of November, 2002.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

At page 2, please replace the paragraph beginning “This application claims priority . . .” with the following replacement paragraph:

This application claims priority to the United States Provisional Application Serial No. 60/210,270, filed June 8, 2000, titled “METHOD AND APPARATUS FOR HISTOLOGICAL AND PHYSIOLOGICAL BIOMETRIC OPERATION AND AUTHENTICATION.”

Beginning at page 10, please replace the paragraphs beginning on line 21 and continuing to page 12, line 4, with the following replacement paragraphs:

In the preferred embodiments of the present invention, a first biological trait is a live physiological trait such as a heartbeat such as that shown in Figure 1. Preferably, the heartbeat is measured so that various features of the waveform can be used to identify the individual whose waveform is being analyzed. For example, the position on the upslope 2 of the heartbeat waveform having the fastest rate of change slope can be recorded and various attributes of that position can be noted. The amplitude of that position 4, its position from the center of the pulse 6 and amplitude of the actual beat relative to the position 8 can all be measured and recorded. Thus, multiple quantitative features can be extracted from a single characteristic of a waveform.

The heartbeat waveform can also be analyzed relative to the major peaks such as the two peaks 10 shown in Figure 1. Various parameters associated with waveform peaks include, but are not limited to, the differences between the two peak amplitudes 12, the differences between the two

peak rates of ~~changes~~ change, the relative position of the dicrotic notch 14, how deep the notch is 16, how far the dicrotic notch is from a zero point or from a reference point 18, and how far the dicrotic notch is from the center of one of the peaks 20, where the peak of the dicrotic notch is located along the horizontal 22, and the position of the various peaks from the center of the waveform 24 and from the center of the other peak 26.

In the preferred embodiments of the present invention, at least one of the biological traits is converted into a digital signal that is signal processed to enhance the trait's capacity to function as a biometric marker or identifier. For example, in the case of a heartbeat waveform, the captured waveform 40 may be filtered 42 and normalized 44 as shown in Figure 2. In some embodiments of the present invention, some of the quantitative features are globally weighted more than others during normalization and authentication. For example, a particular feature, such as the slope of the dicrotic notch 34, may be considered more or less reliable as an identifier and thereby may be given more or less "statistical" weight. Likewise, the correlation between two measurements for a particular feature or the correlation between two different features may be stronger than for other features and be weighted accordingly.

Beginning at page 13, line 18, please replace the paragraph with the following replacement paragraph:

In the preferred embodiments of the present invention, the biometric authentication system is designed to operate on a portable computerized device such as a PDA or cell phone. Figure 3 shows an embodiment of the present invention wherein a portable device includes a single computer chip 50 operably connected to a light emitter 52 and detector 54. In this embodiment, an infrared

light (IR) transmitter 52 transmits an IR signal into a person's finger when the finger is placed on the transmitter 52 (whether for purposes of enrollment or verification). The signal transmitter 52 is activated and a signal is emitted from the signal transmitter 52 and is transmitted into the dermal and subdermal tissues of the person's finger. The signal is partly absorbed and reflected by the dermal and subdermal tissues. The reflected signal is received by a signal receiver 54 and transmitted through receiving wires to a chip 50 where the received signal is processed.

IN THE CLAIMS:

1. (Amended) A computer-implemented method for biometric authentication, said method comprising:

reading a first ~~live internal biological trait~~ unique, hemodynamic waveform of an individual;

analyzing said waveform to identify unique traits;

reading a second unique, internal physiological ~~biological~~ trait of said individual; and

authenticating the identity of said individual if both of said waveform and said physiological

trait ~~biological traits~~ correspond with previously enrolled ~~biological~~ traits ~~taken~~

recorded for said individual.

4. (Cancel)

11. (Amended) ~~The method of claim 9 wherein~~ A method comprising:
reading a first live internal biological identifier of an individual, said first live internal
biological identifier being a heartbeat waveform measured by reflecting light off of
the subdermal layers of skin tissue on said individual;
analyzing said waveform to identify unique traits;
reading a second live internal biological identifier of said individual, said second live
internal biological identifier comprises comprising bone density; and
authenticating the identity of said individual if both of said biological identifiers correspond
with previously enrolled biological identifiers taken for said individual.

16. (Amended) A method comprising:
presenting an individual's live body tissue to an authenticating device for the capturing of
a first ~~live internal biological identifier~~ unique, hemodynamic waveform of said
individual, ~~said first live internal biological identifier being a heartbeat;~~
analyzing said waveform to identify unique features;
providing a second unique, internal biological physiological identifier of said individual to
said authentication device;
authenticating said second physiological identifier by comparing the unique features
with those recorded for that individual;
upon authentication by said device, operating said device to perform functions previously
inaccessible to unauthorized individuals, said authentication taking place upon the
matching of both of said ~~biological~~ physiological identifiers with previously enrolled
~~biological~~ physiological identifiers taken for said individual.

20. (Amended) A computer software program embodied in a transmission medium such as a carrier wave comprising instructions for:

reading a first ~~live internal biological trait~~ unique, physiological hemodynamic waveform of an individual;

analyzing said waveform for features unique to said individual;

reading a second unique, internal biological physiological trait of said individual; and

authenticating the identity of said individual if both of said ~~biological~~ physiological traits correspond with previously enrolled ~~biological~~ physiological traits taken for said individual.

23. (Amended) The ~~signal program~~ of claim 20 wherein said second unique, internal biological physiological trait is measured by reflecting light off of the skin of said individual.

28. (Amended) A computer-readable medium comprising instructions for:

reading a ~~first live internal biological identifier~~ unique hemodynamic waveform of an individual; ~~said first live internal biological identifier being a heartbeat;~~

analyzing said waveform to identify unique traits;

reading a second ~~live internal biological~~ physiological identifier of said individual;

and

authenticating the identity of said individual if both of said waveform and said biological identifiers physiological identifier correspond with previously enrolled ~~biological~~ identifiers ~~taken~~ recorded for said individual.

30. (Cancel)

33. (Cancel)

34. (Cancel)

35. (Amended) A layered biometric authentication system comprising:
a portable computerized device having an infrared emitter and detector operably connected
to a single computer chip;
means for capturing a ~~first live internal biological identifier~~ unique hemodynamic waveform
of an individual, said means being located on said portable device and operably
connected to said computer chip; ~~said first live internal biological identifier being a~~
~~heartbeat~~, said ~~first internal biological identifier~~ waveform being measured by
reflecting light off of the subdermal layers of skin tissue on said individual;
means for analyzing said waveform to identify unique traits;
means for capturing a second ~~live internal biological~~ physiological identifier of said
individual, said means for reading the second ~~biological~~ physiological identifier
being located on said portable device and operably connected to said computer chip;
means for verifying physiological activity, said verifying means being operably connected
to said computer chip; and
means for authenticating the identity of said individual if both of said waveform and said
~~biological identifiers~~ physiological identifier correspond with previously enrolled
~~biological identifiers taken~~ recorded for said individual, said means for authenticating

weighting some quantitative features of said biological identifiers more than other quantitative features of said biological identifiers.